


Intelligent tools from Dauphin Precision



1881. Chester Arthur was President of the United States. Wyatt Earp, Doc Holiday, and the Clanton gang shot it out at the OK Corral. The Chicago White Stockings (later the Cubs) cruised to their second straight pennant against teams like the Troy Trojans and the Worcester Ruby Legs. And George M. Brubaker started a cutting tool company in Millersburg, PA.

Much has changed in the US since 1881, but not the pride and dedication to customer service that has sustained Brubaker Tool. It's why Brubaker is still growing after 127 years in business. It is also why Brubaker's sister brands FastCut, Weldon, and Data Flute are strong and growing as well. These brands combined – under the Dauphin Precision Tool and Berkshire Precision Tool umbrella – offer high quality, engineered endmills, and taps in *all* the high speed steel grades, *all* the powdered metal grades, and even different grades of carbide, including premium carbide and through-hole carbide. Plus they have the expertise to tailor the tool to the specific application – right down to the specific machining center. In both carbide and HSS grades they boast some of the quickest turnaround times in the industry on specials. No wonder they're probably the largest supplier of high speed steel (HSS) endmills to the demanding aerospace market.

Dauphin Precision Tool, LLC and Berkshire Precision Tool, LLC are the legal names for the operating companies. The companies go to market under the Brubaker, FastCut, Weldon, and Data Flute brand names.

Made with pride in the USA: Tools from Brubaker, FastCut, Data Flute, and Weldon, range in size from 1/8 to 3" in diameter and run the gamut of high speed steel, powdered metal, and carbide grades

When Endmill A on Machine A does not equal Endmill A on Machine B

Getting a customized tool is important because as owner Bill Coyle explains: “You can take an endmill that performs fabulously and move it to another milling machine doing the identical operation on the identical material to produce the identical part and it may not work as well on that other setup – depending on how rigid it is, how old it is, and so forth. Our job is to give our customers the best substrate, the best geometry, the best coating, the best finish, and the best end features for their application. We’re vitally committed to tailoring the endmill and everything that goes into it to the application. And we consider not only the material they’re machining, not only the operation they’re performing on the material, but also the machining center they’re using.”

This kind of customization is becoming increasingly important as spindle speeds are reaching thirty to forty thousand RPM. “You’re not going to be able to take a garden variety endmill and put it on a high speed machining center and capture the kind of productivity that you’ve paid for with that machining center,” says Bill Coyle. “The faster something spins, the less tolerant it is of any imperfections and the more susceptible it is to any slight imperfections in geometry, in balance, or anything else. So the quality of endmills will become even more critical as the speed and capability of capital equipment improves.”



Not much to see during a tool grind on a Walter Helitronic Vision, thanks to a 600 PSI coolant jet into the fluting wheel to keep it open and cutting well, plus 200 PSI into the grinding zone to keep the part cool

Building the right tool takes analysis

A consistent theme that comes up within Dauphin is that although they are small enough to be extremely responsive to customers, they are large enough to dedicate considerable resources to things like test and analysis. For example, their in-house metallurgy lab can assess tool substrates and coatings and they routinely test new materials and random tool samples, plus diagnose any problems from the field. Their statistical process control (SPC) system ensures that every tool can be traced from the material source through the entire production process. They also use SPC to wring out variations in their processes and to achieve ever tighter tolerances on critical tools. And they have their own machining center for testing all their new endmills and taps, whether they’re carbide, HSS, cobalt, or powdered metal.

Good vibrations, good people

Vibratory analysis equipment is another example. The idea is to use the harmonics that occur in a spindle to accurately predict the “sweet spot” for a particular machining operation (i.e. what tool and at what feeds and speeds will work best). But it’s not just a matter of buying some fancy equipment and expecting an answer. Applying this technology requires a very knowledgeable staff, which is why Dauphin is a little obsessive about its hiring practices. Let’s just say that they ensure their sales engineers know how to run a tool. Solving a tough applications challenge with a specialized tool is a regular occurrence for these brands.

Heat treating with a difference

Unlike other vertically integrated tool manufacturers, Dauphin’s Millersburg operations (Brubaker, FastCut, and Weldon) use barium-salt furnaces rather than vacuum furnaces to harden their HSS blanks. Bill Coyle explains that “barium-salt heat treat gives a much more uniform heat than a vacuum furnace, particularly on the large diameter aerospace tools and the large diameter taps going to energy and other industries. You can’t beat it.” Cliff Hanner, Vice President for Engineering and Quality Control, added that “the furnaces are fully automatic, with special programs for each tool type. Each blank progresses through a pre-heat furnace, a high-heat furnace, a quenching furnace, an air chamber to cool,

and a washing unit. The tools then receive three or four tempering cycles to ensure proper structure. Computers monitor the entire process and every lot is traceable, with a complete record of how long it was treated at what temperature.”

Cliff explains that “You want the tool holder’s set-screw to be able to bite into the tool. So after hardening the blanks we draw the shank back with an induction coil to soften the clamping surface to about 50 Rockwell. Then we grind the shank to within three or four tenths – three tenths for aerospace tools and four for ANSI tools. But it’s not like grinding a normal cylindrical part. The shank actually varies in hardness, from 50 Rockwell at the end of the shank to 67 toward the flute, and it also has flats.”

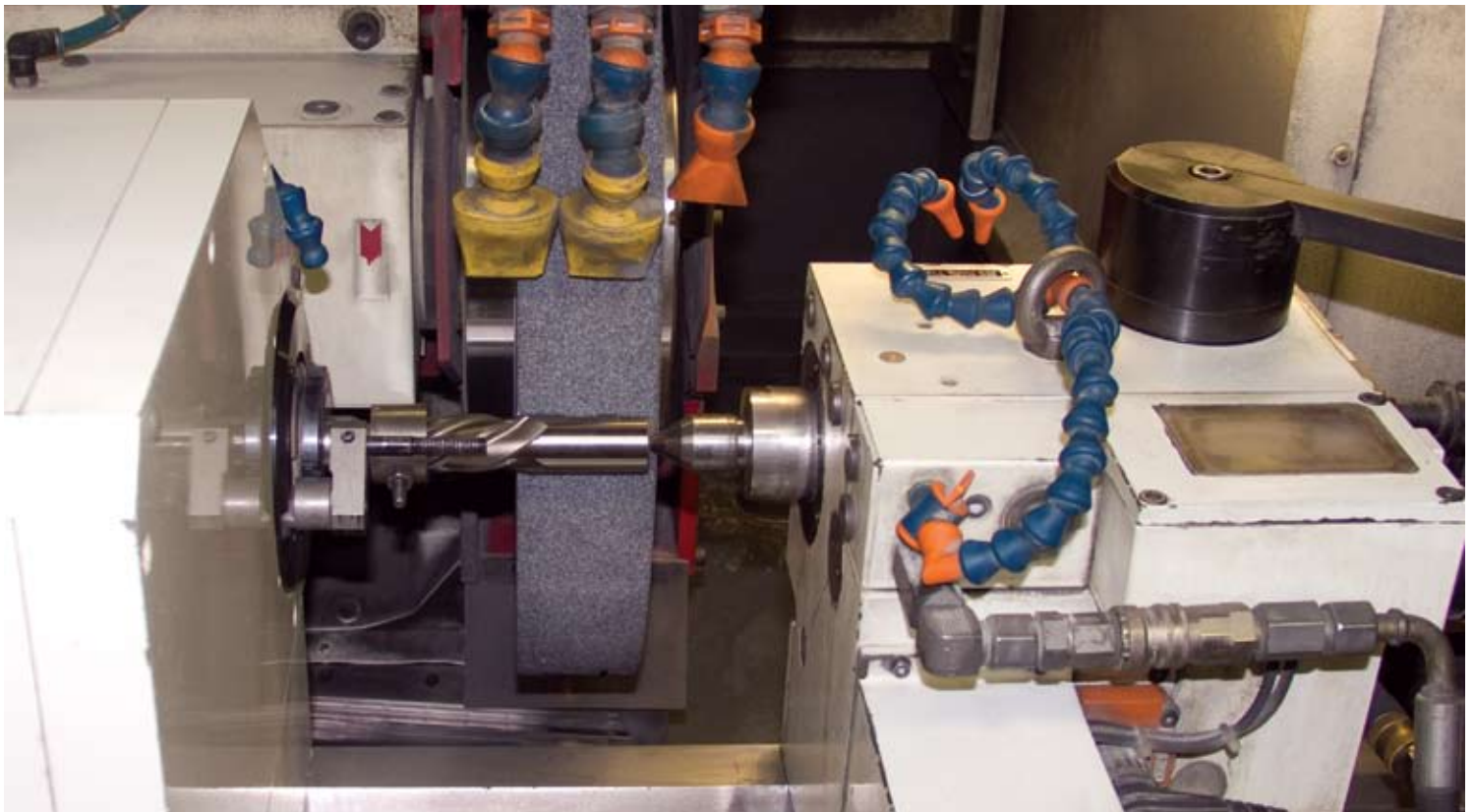
Creating the final tool geometries

Unlike carbide, an HSS tool’s flute forms can be pre-milled. In both cases the detailed end face work, cutting edges, and clearances must be ground, necessitating five axis tool grinders to finish the tool. The extraordinary productivity of Walter’s Helitronic Vision machine has encouraged making more of both kinds of tools “from solid” in one setup. Dauphin has been investing in the

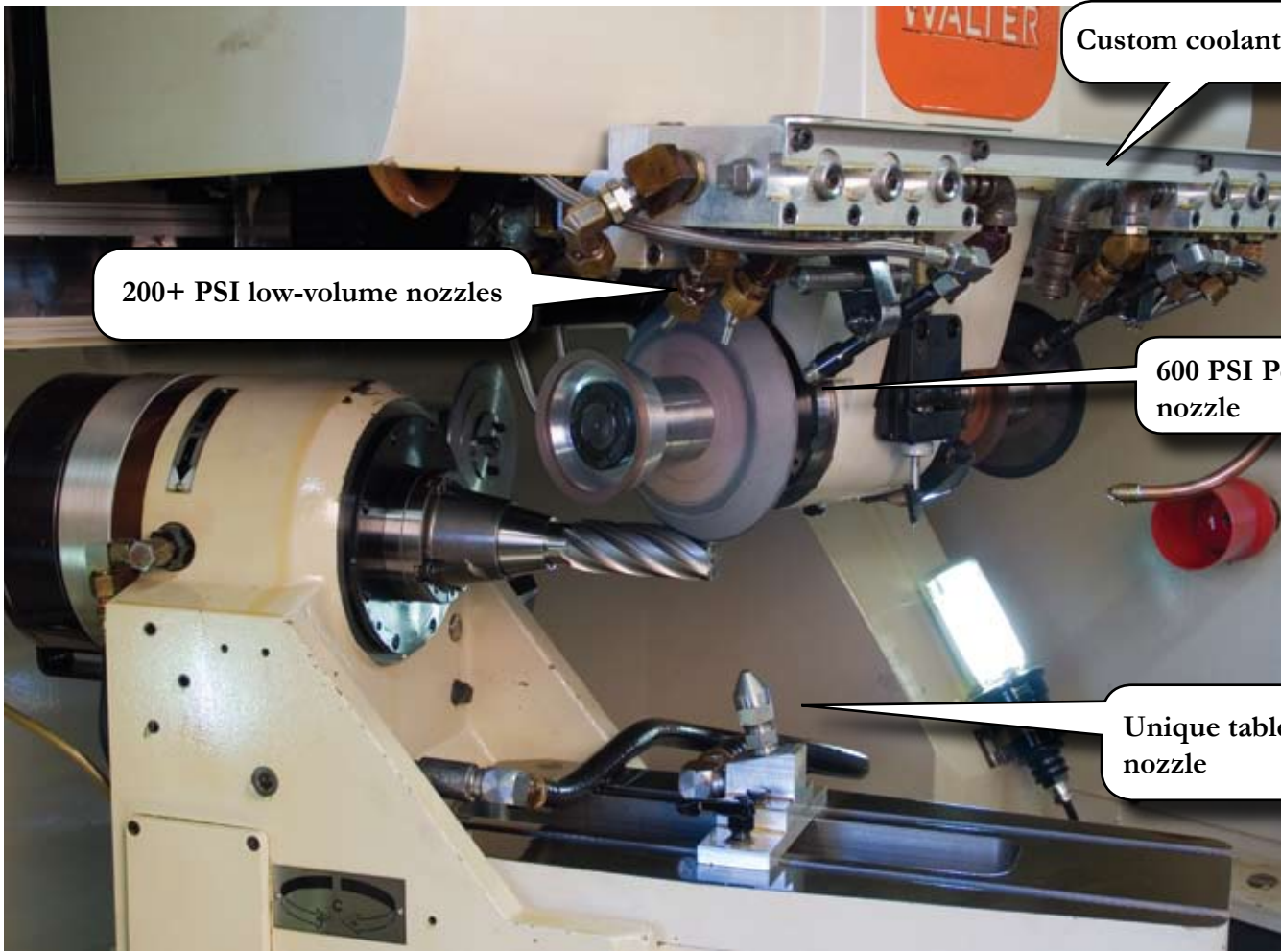


On the bench: Endmill blanks after they’ve been fully hardened and the shanks have been “drawn back” with an induction coil. In hand: After the shank has been ground to within a few tenths on a Studer. It’s more challenging than it appears because each shank has flats and varies in hardness from 50 to 67 Rockwell.

machines for both the Millersburg HSS operations and the carbide plant in Pittsfield, Massachusetts. Vision machines boast 44 HP and extremely fast and smooth linear motors for the finest finishes in the shortest possible time.



After heat treatment, the shank of each blank is ground between centers on a Studer, in this case an S33. The machines are so inherently accurate that Brubaker has never used the in-process gauging. They also have several 26 year old Studer S40s that still hold tenths.



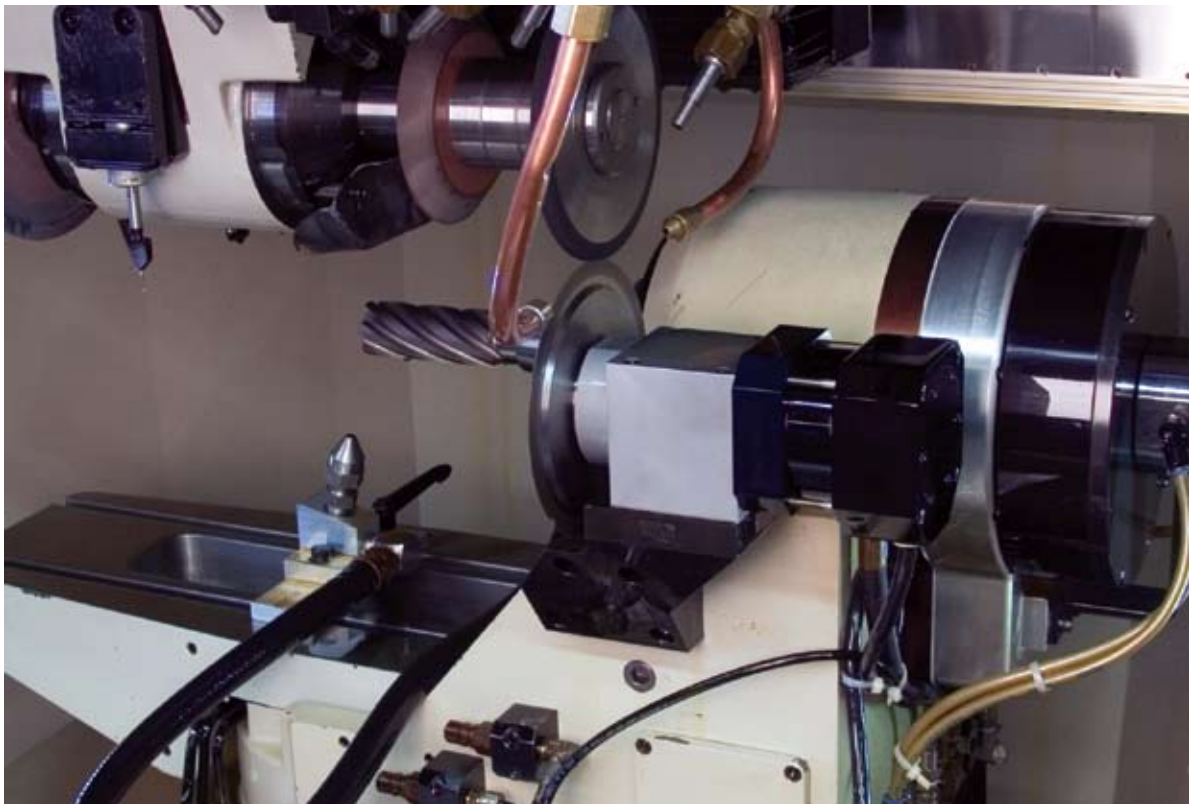
Custom coolant manifold

200+ PSI low-volume nozzles

600 PSI PowerFluter nozzle

Unique table-mounted nozzle

Turning off the coolant on a Helitronic Vision's fluting operation to show Dauphin's unique system



Dressing on the machine makes sense for big HSS tools and Walter offers this system to do it. Says Cliff Hanner: "We use CBN for all the gashing and other end-face operations and we true those wheels off-line. When fluting from solid we use a more dressable wheel and do that on the machine, because the form breaks down faster on the big tools. The same would hold for grinding a roughing form."

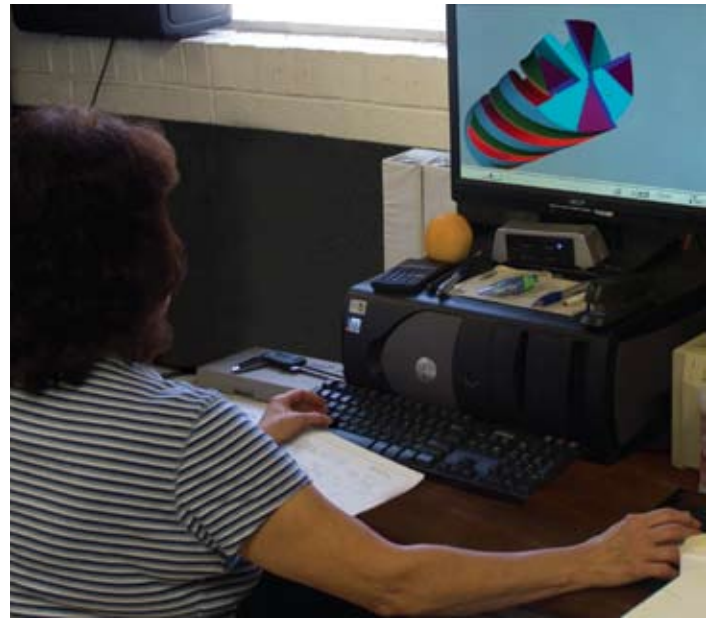
Creative cooling

Another reason Dauphin can grind big tools fast is their creative approach to coolant. They use Walter's PowerFluter system to blast a 600 PSI coolant jet into the fluting and gashing wheels to keep them cutting freely. Plus they developed a custom manifold to mount rigid high pressure coolant pipes for each grinding operation. They have also installed specialized low-volume, high-pressure nozzles, which they aim with a laser. According to Cliff, "High speed steel tends to burn more than carbide, even under a flood of oil coolant. But we never see any burning with this engineered coolant setup."

Maintenance and Facilities Manager John Grow added that all the tool grinders run off a central coolant system of "12,000 gallons, filtered to two to three microns, and chilled to 100 to 105°. The system delivers 200 to 235 PSI to each machine, boosted to 600 PSI by the wheel cleaner." Their custom coolant manifold actually delivers lower volume than the standard Walter unit, but at higher pressure. And because each nozzle points exactly where it's needed, the system prevents heat damage.



Operator Tim Wixted aims a coolant nozzle with a laser. The pipe is rigid in order to handle 200+ PSI. Tim reports that "Once you set the nozzle you're set until you change the wheels. They don't move."



Programming the grind on a PC, complete with 3D simulation, eliminates the need to do any programming on the machine

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By measuring their grinding wheels in a Walter Helicheck, operators can get an extremely accurate simulation of the grind in advance, minimizing the need for tweaking on the machine



Operator Linda Wendt puts an endmill into a Walter Helicheck... Selects the parameters she wants to measure... Stands by as the machine does its magic... And reviews the certified inspection report. Graphics make it easy to see where each measured value falls within its tolerance band



Off-line setup minimizes setup time

Dauphin also takes full advantage of Walter's "Automated Toolroom" concept, in which the tool grinders are networked with measuring machines and PCs for off-line setup. Two operators can manage the entire cell and each is fully capable of setting up all the machines. They measure grinding wheels in a Walter Helicheck (repeatable within one micron) and use that data to program the grind with Walter's Tool Studio software. The resulting 3D simulation accurately predicts the real grind, so they can confidently tweak the program, move it to one of the Vision machines and grind.

Intelligence never goes out of style

Whatever the next 127 years brings for the Dauphin family of Brubaker, FastCut, Weldon, and Data Flute, one thing is certain: They have a clear view forward that makes sense. As owner Bill Coyle puts it, "We're big enough to have the resources we need to be able to provide the technical assistance at the spindle, to be able to do the specials work, to be able to look at different grades of substrate, at different coatings, through-hole geometries, and so forth. But we're small enough that when someone needs a special order, when someone needs special attention and service – we can provide it." ■



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